

# MAGNETI MARELLI

UA2 przystawka do pompowtrysków

*User's Manual*

007935095260



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## Company Information

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# Warranty

## 2 –YEAR UA2 ATTACHMENT LIMITED WARRANTY

“MAGNETI MARELLI” company manufactures its equipment from new parts and components that are in accordance with industry-standard practices. MAGNETI MARELLI warrants that the equipment it manufactures will be free of defects in materials and workmanship. The warranty terms are 2 years, beginning on the date of the MAGNETI MARELLI invoice in accordance with the following described:

This warranty does not cover damage due to external causes, including accident, abuse, misuse, scratches on external components or surfaces, problems with electrical power supply, servicing not authorized by MAGNETI MARELLI, usage not in accordance with machine’s operating manual, failure to perform required preventative maintenance, failure to change the testing calibration oil fluid (and cleaning detergent) when indicated by machine, failure to change the testing (and cleaning) fluid filter when indicated by machine, to permit machines fluid pump to sit or operate without fluid in it, usage of improper testing or cleaning fluid in the machine not provided or indicated/approved by MAGNETI MARELLI, use of parts and components not supplied or approved by MAGNETI MARELLI.

**Note:** Failure to clean injectors with MAGNETI MARELLI’s ultrasonic device (provided) before any test is performed on the UA2 Attachment test bench will void the warranty of the machine. *If the sensor readings are out of specification or accuracy due to dirt (verified), the machine’s warranty will be voided.*

MAGNETI MARELLI will repair or replace parts and components returned to manufacturer’s facility. To request warranty service, contact MAGNETI MARELLI within the warranty period. If warranty service is required, you must ship the defective part or component in their original or equivalent packaging, prepay shipping charges, and

insure, or accept the risk of loss or damage during shipment. MAGNETI MARELLI will return the repaired or replacement part or component freight prepaid. If MAGNETI MARELLI repairs or replaces a part or component, its warranty term is Not Extended.

MAGNETI MARELLI does not accept liability beyond the remedies set forth in this warranty statement or liability for incidental or consequential damages.

# Chapter 1

## “Introduction”

Unit Injection systems are commonly used on agricultural, industrial and heavy truck applications. Each injector incorporates its own high pressure pump system, hence the name Unit Injection Systems.

Nowadays, the use of electronic control for the UIS (Solenoid or Piezo actuation), is incorporated for a more accurate system, providing more power and economy to the consumer.

MAGNETI MARELLI, a leading manufacturer in Automotive Injection Service Solutions, offers the UA2 attachment unit for operating all UIS Unit Injector Systems (Injectors and Pumps) presently used, and provides upgradeability and adaptability for future Injectors.

### Equipment checklist

Carefully unpack the machine and its components. Save the box and packaging materials for future use.

Check if you have all the following items:

- UA2 Attachment Unit
- Adapters and Accessories Kit for Testing Injectors [look at Appendix B]
- Adapters and Accessories Kit for Cleaning Injectors [look at Appendix B] [UA2-X1 only]
- Operating Manual and Quality Control Certificate

## Options

There are a number of options to make the UA2 Attachment unit even more powerful and universal in diagnosing and servicing the Diesel Injectors. The following options are available:

Code	Description	Hardware Needed	Models
<b>MACC</b>	Upgrade Kit	YES	UA2-X0
<b>EUI ADAPTS</b>	EUI Injector Adapters <i>(Request availability list from your local dealer)</i>	YES	UA2-XX
<b>PS1</b>	Portable stand for UA2 Attachment	YES	UA2-XX

# Chapter 2

## “Product Tour”

This chapter provides an overview of the UA2 attachment exterior views and connections. It covers the following topics:

- Front View
- Side View
- Rear View
- Rear View Symbols
- Serial Tag

A new user should be familiar with all the views and connections in this chapter.

## Front View

- a. Front Panel
- b. Injector Return Pressure UIS[P]
- c. Injector Return Pressure Indicator
- d. Injector Spray Chamber Drawer
- e. Injector Spray Chamber
- f. Injector Spray Chamber fumes extractor
- g. Clear Protective cover
- h. Injector Adapter Assembly (sample)
- i. EUI Injector (Not Included / sample)
- j. Injector Push Rod
- k. Push Rod Shims
- m. Pneumatic Drive Cylinder
- n. Spray Chamber LED
- o. [D] Hydraulic Quick connector for main unit (Discharge from Spray Chamber) (Some versions do not require this connection)
- p. Unit adjustable support pads



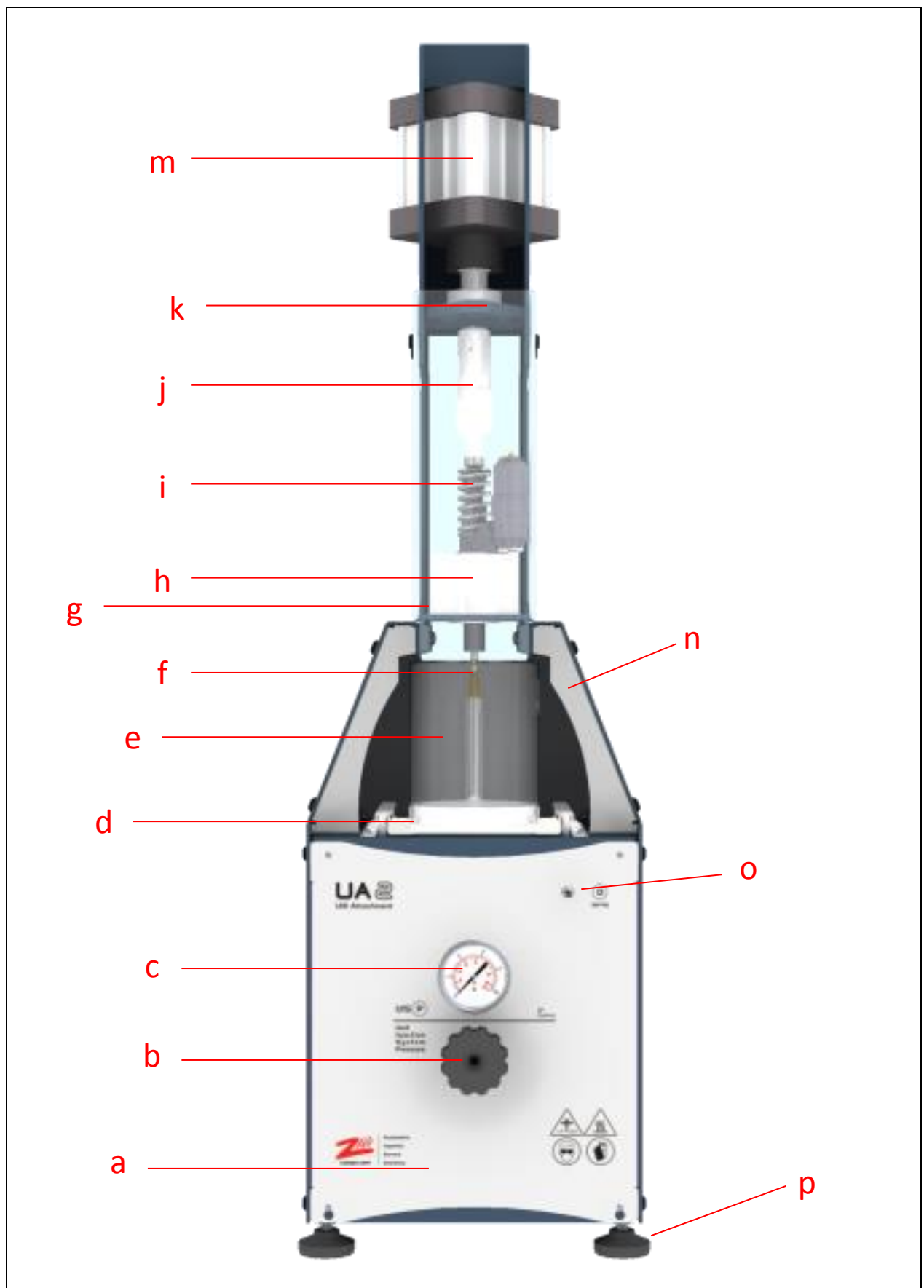


Figure 2-i

## Side View

a. Electrical connection [x.1] for main unit digital instructions

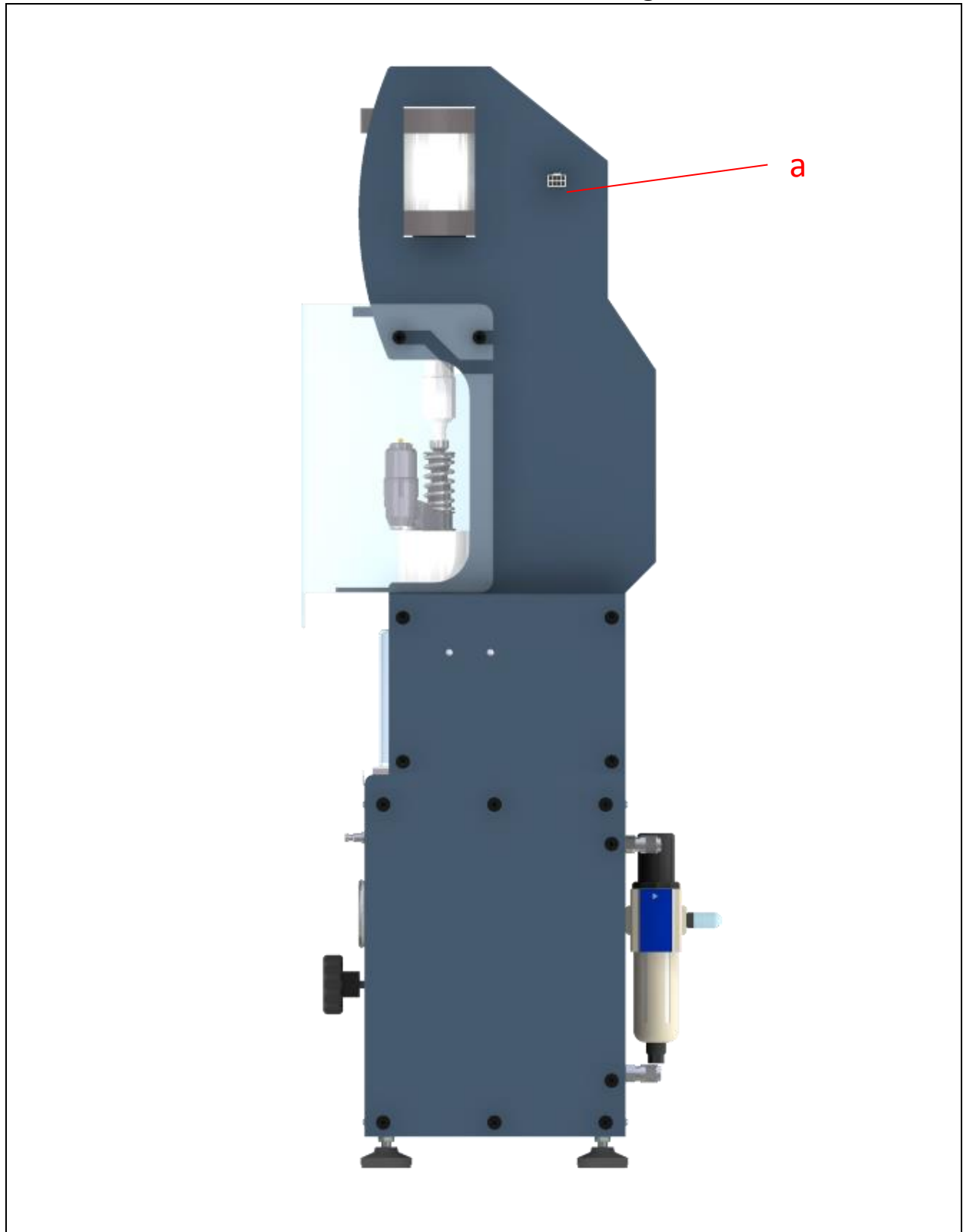


Figure 2-ii

## Rear View

- a. Serial Tag
- b. Output / Adapter Hydraulic Connections
  - i. Return [R]: Return to Main Unit  
Connect to [R] when testing, or to [C] when cleaning
  - ii. Regulated Return Line [RR]  
Connect to Adapter Return port (UI/UP adapter upper port)
  - iii. Feed Line [F]  
Connect to Adapter Feed Return Port (UI/UP adapter lower port)
  - iv. Free Return Line [FR]  
Connect to Adapter Return Port (e.g. Cummins Adapter)
- c. Electrical connection [x.2] for main unit instructions
- d. Supply Hydraulic Connections from main unit
  - i. Clean Fluid (Left) [UA2-X1]
  - ii. Test Fluid (Right)
- e. Spray Chamber fumes extractor output
- f. Regulated and filtered compressed air input
- g. Rear Panel

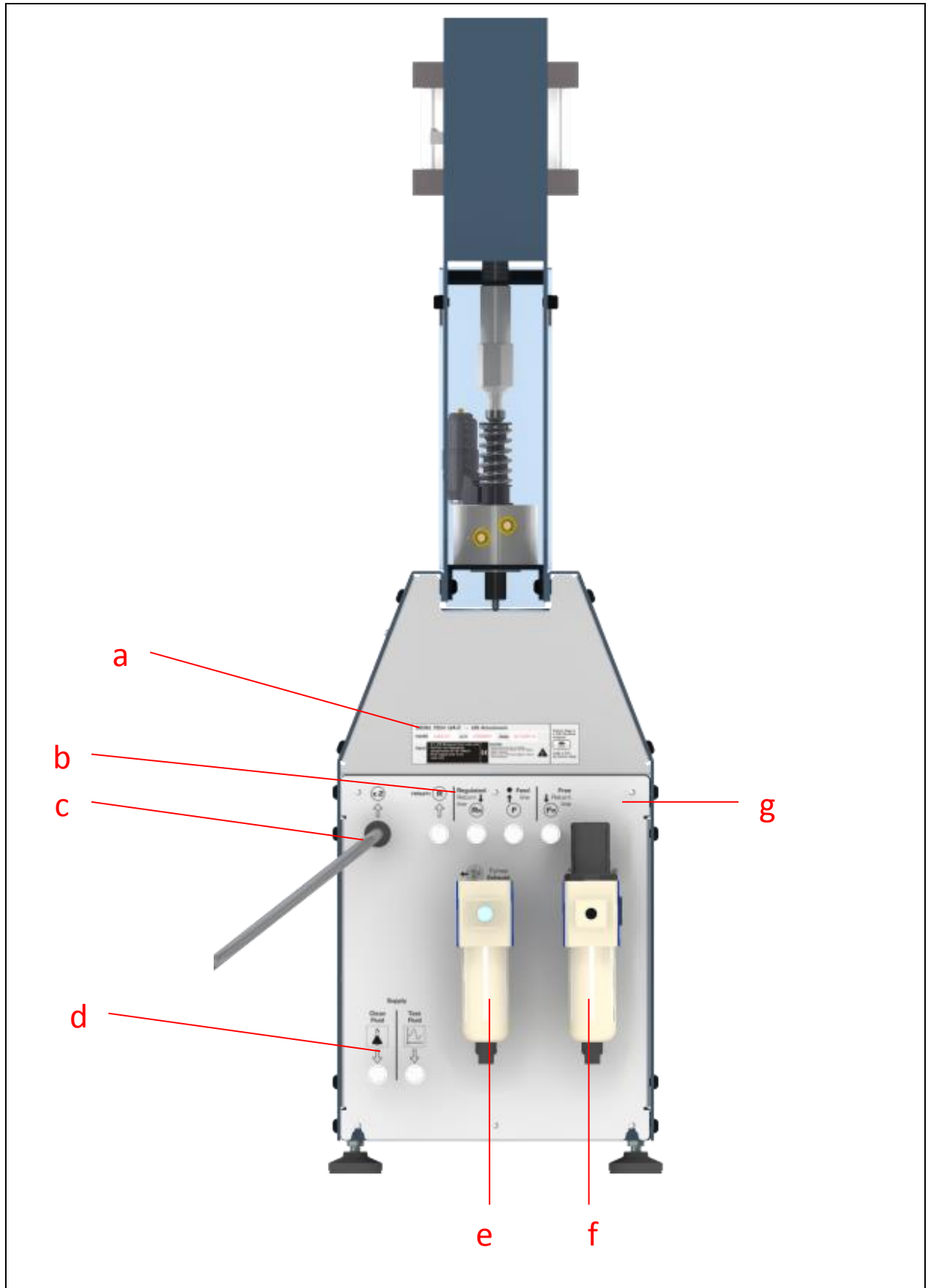


Figure 2-iii

# Chapter 3

## “Getting Started”

This chapter provides basic information to start using the UA2 Attachment unit and covers the following topics:

**[info]**

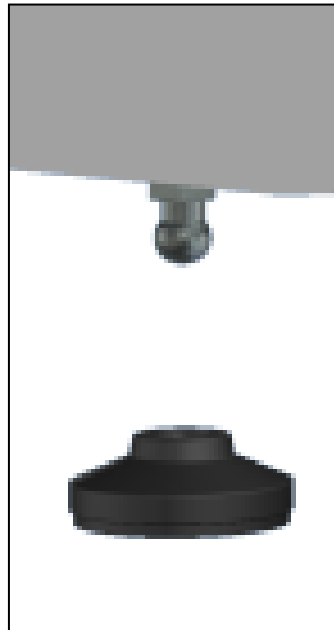
All users should be familiar with diesel systems and should always wear protective goggles and gloves.

- Unpacking and setting up
- Connecting the Electrical connections
- Connecting the Pneumatics
- Connecting the Hydraulics

A new user should follow the steps in each section of this chapter in order to operate the machine.

## Unpacking and setting up

- Verify that all the items in the equipment check list in Chapter 1 are present
- Place the UA2 Attachment Unit, in a clean and well ventilated space, on the Left of the Main Unit
- Use a leveled, steady bench that can support the weight and vibrations of the machine, or use the PS1 Portable Stand [optional]. When using the PS1, the adjustable support pads of the UA2 Attachment unit may need to be removed (Figure 3-i).



**Figure 3-i**

## Connecting the Electrical connections

Verify that the x.1 and x.2 Electrical Connections are both connected to the main unit and the UA2 unit, before switching on the main unit (Figure 3-ii).

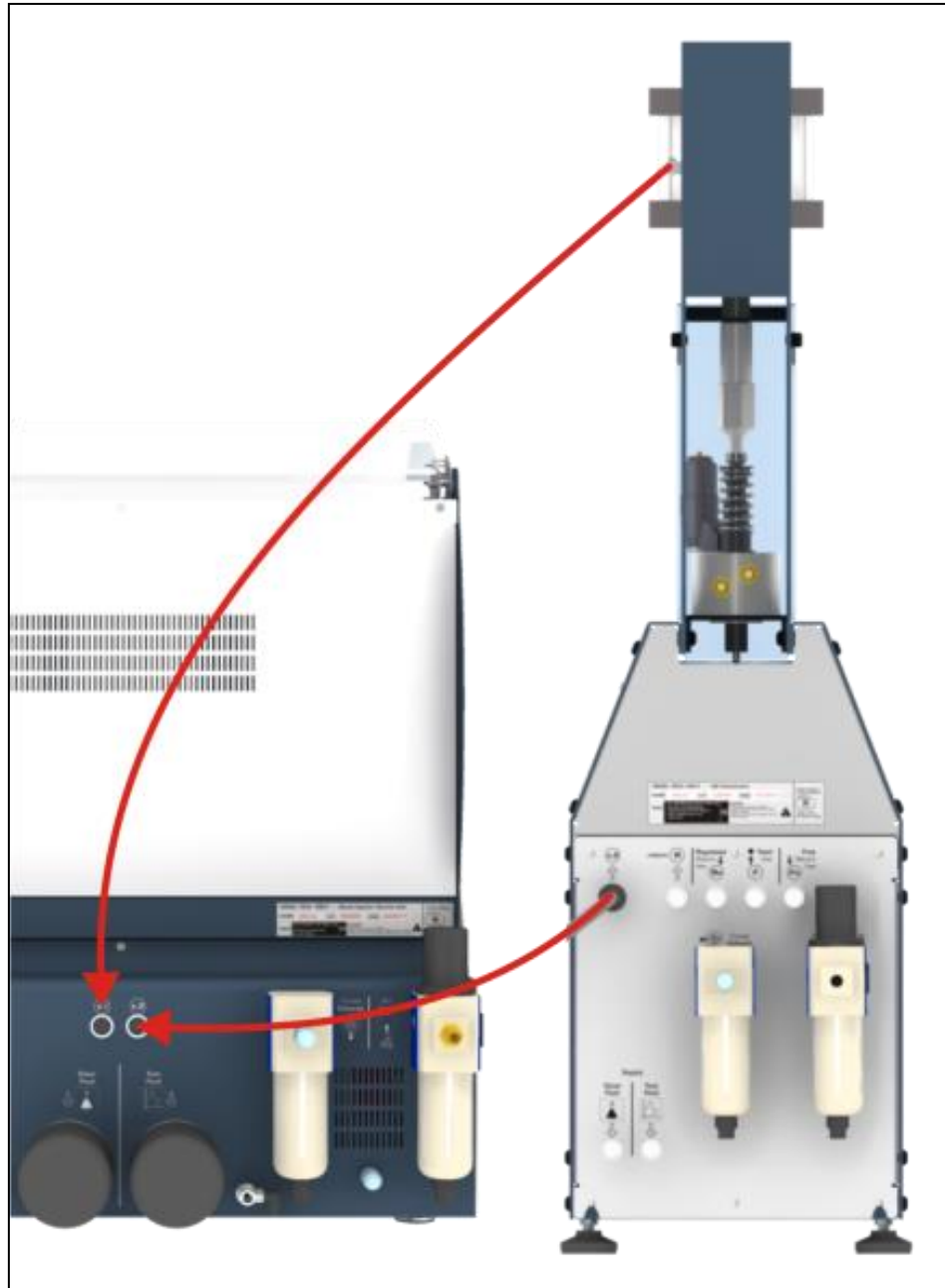


Figure 3-ii

## Connecting the Pneumatics

### [info]

- Always use a Water Trap/Filter/Regulator to connect the Air Supply to the machine, even if the Shop Air Compressor has a dehumidifier installed.
- Always use the nearest route to the Shop Air Compressor and avoid Air Hose bottlenecks, in order to achieve maximum Air Pressure and Air Flow. Follow the specifications in Appendix A.
- While the unit is operating, the input pressure should not drop less than 6.5 bar. If this occurs than the compressor is not capable of providing adequate flow at the desired pressure.

Use a hose fitting (not provided) to connect the Water Trap / Regulator to the hose that leads to the Shop Air Compressor.

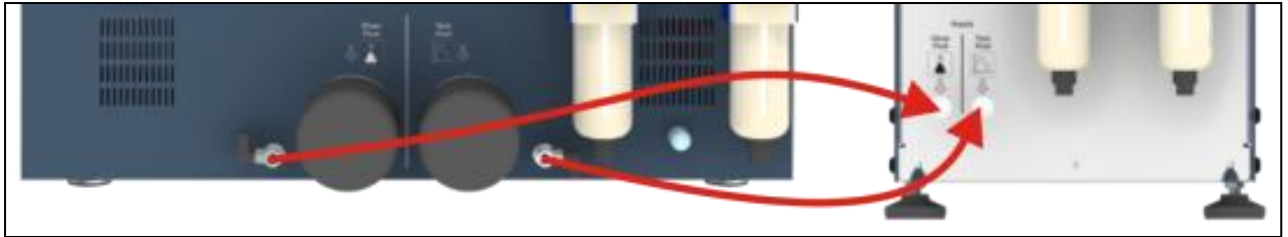
### [important]

- A periodic emptying of the vacuum collector is needed.



## Connecting the Hydraulics

Connect the Drain Ports from the main unit to the Rear Supply Ports of the UA2, for the Testing and Cleaning fluids, and switch on the valves, in order to have fluid entering the UA2 Attachment unit (Figure 3-iii).



**Figure 3-iii**

# Chapter 4

## “Software Tour”

This chapter provides useful information on the UA2 LCD menu. It covers the following topics:

- Selecting the correct injector
- Adjusting operation characteristics

A new user should comprehend this chapter prior to operating the UA2 Attachment unit.

### Selecting the Correct Injector

Follow the instruction in main units operation manual e.g. DS2 operating manual.

Example for the DS2 unit, choose the number 2 option:

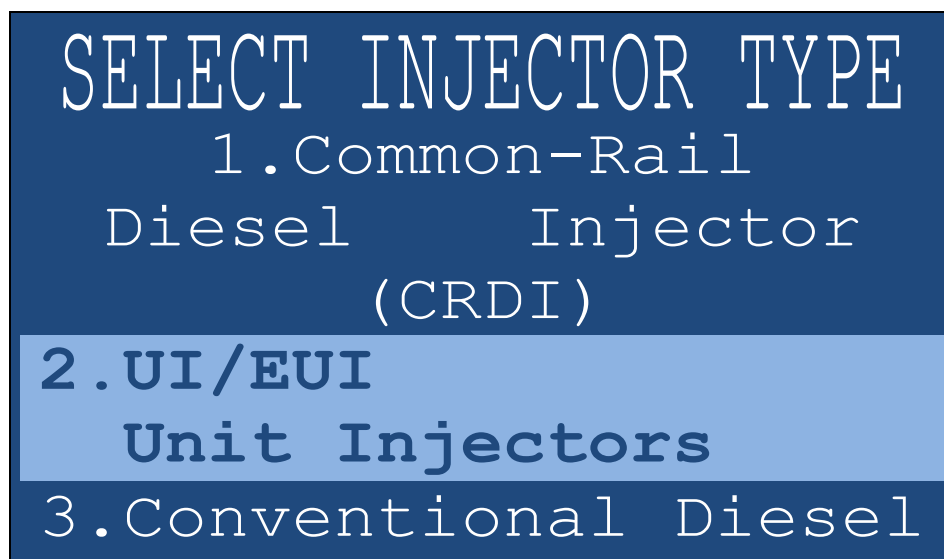


Figure 4-i

## Adjusting Operation Characteristics

While a Test or Clean Program is running, a similar screen like (Figure 4-ii) will appear. The "T" and "W" values are there to fine tune if needed.

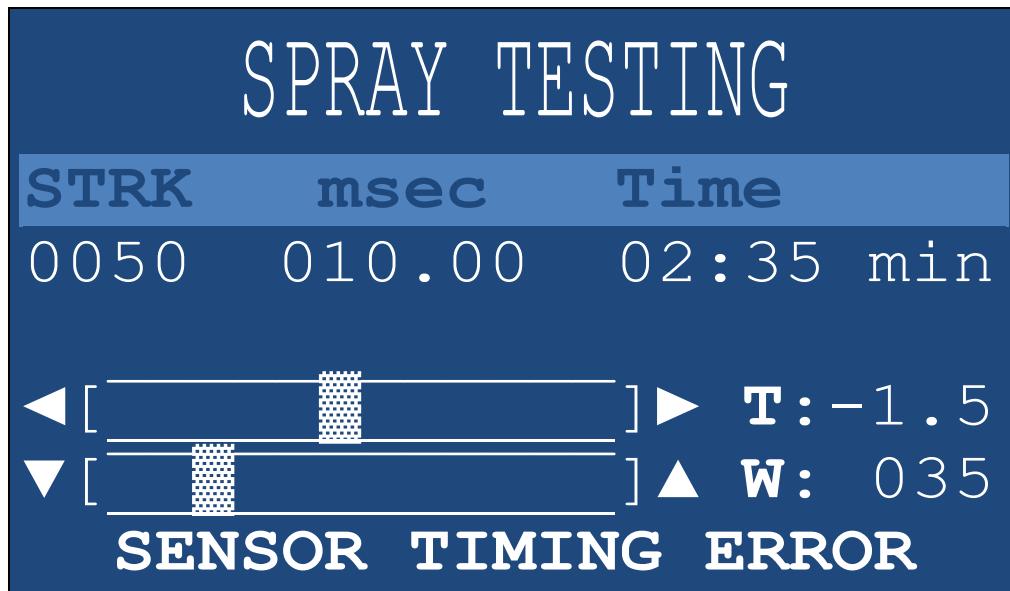


Figure 4-ii

"T" value: is used to adjust the timing of the downward movement of the Push Rod (CAM) in relation to the electrical actuation of the injector. Typical values are from -2..+2. This value is different between injector manufacturers, and it is automatically loaded when a selection is made. For fine tuning, please use the Left and Right arrows on the main unit.

"W" value: is used to simulate the Cam Lobe Curve, in other words the total time the Push Rod is active per Stroke. Default value is 35. For fine tuning, please use the Up and Down arrows on the main unit.

**[important]**

- If a **SENSOR TIMING ERROR** message appears on the bottom of the screen, the injector will not operate, please consult Chapter 7 “Troubleshooting”

# Chapter 5

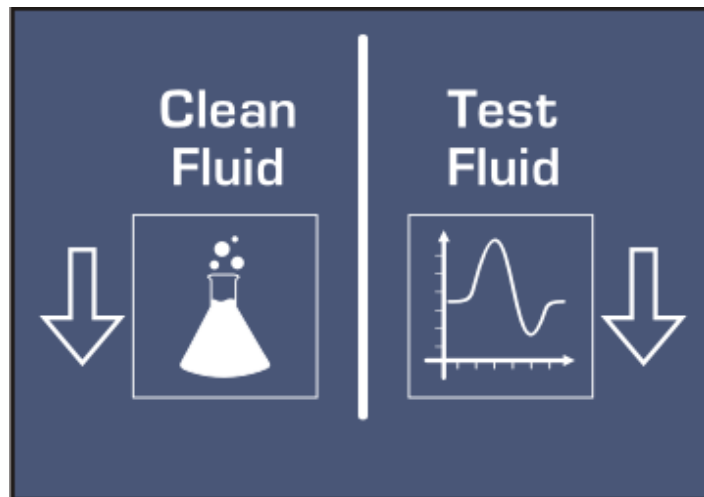
## “Prepare for Operation”

This chapter provides useful information on preparing the UA2 attachment unit and the injectors for the initial operation. It covers the following topics:

- Fluids and Connections
- Control Panel
- Injector – Adapter Assembly
- Injector Mounting to UA2 unit
- Push Rod and Shims Adjustment
- Electrical Power to Injector

### Fluids and Connections

The UA2 attachment comes with half a tank of Testing fluid (Diesel Calibration oil) and an empty tank of Cleaning fluid. The machine tank indicators, filters and drain valves are divided into two parts, left/right and are shown on the rear panel of the machine (Figure 5-i).



**Figure 5-i**

**[info]**

- Always check if you have acceptable levels of fluids.

**[important]**

- Always have the Hydraulic supply lines connected from the main unit, onto the UA2 unit.
- Always Switch ON/OFF the Fluid Drain valves on the Rear panel of the main unit.

## Control Panel

When using the UA2 Attachment unit, always use the Option on the Control Panel: "UI/EUI/HEUI Unit Injector" Types.

## Injector – Adapter Assembly

Each Injector or Pump, requires a specific adapter to properly operate, you can acquire any adapter from you local dealer.

### **[important]**

- Always apply a small amount of grease on the injector o-rings for proper insertion to the adapter
- Always use a downward rotating force when inserting the injector to the adapter

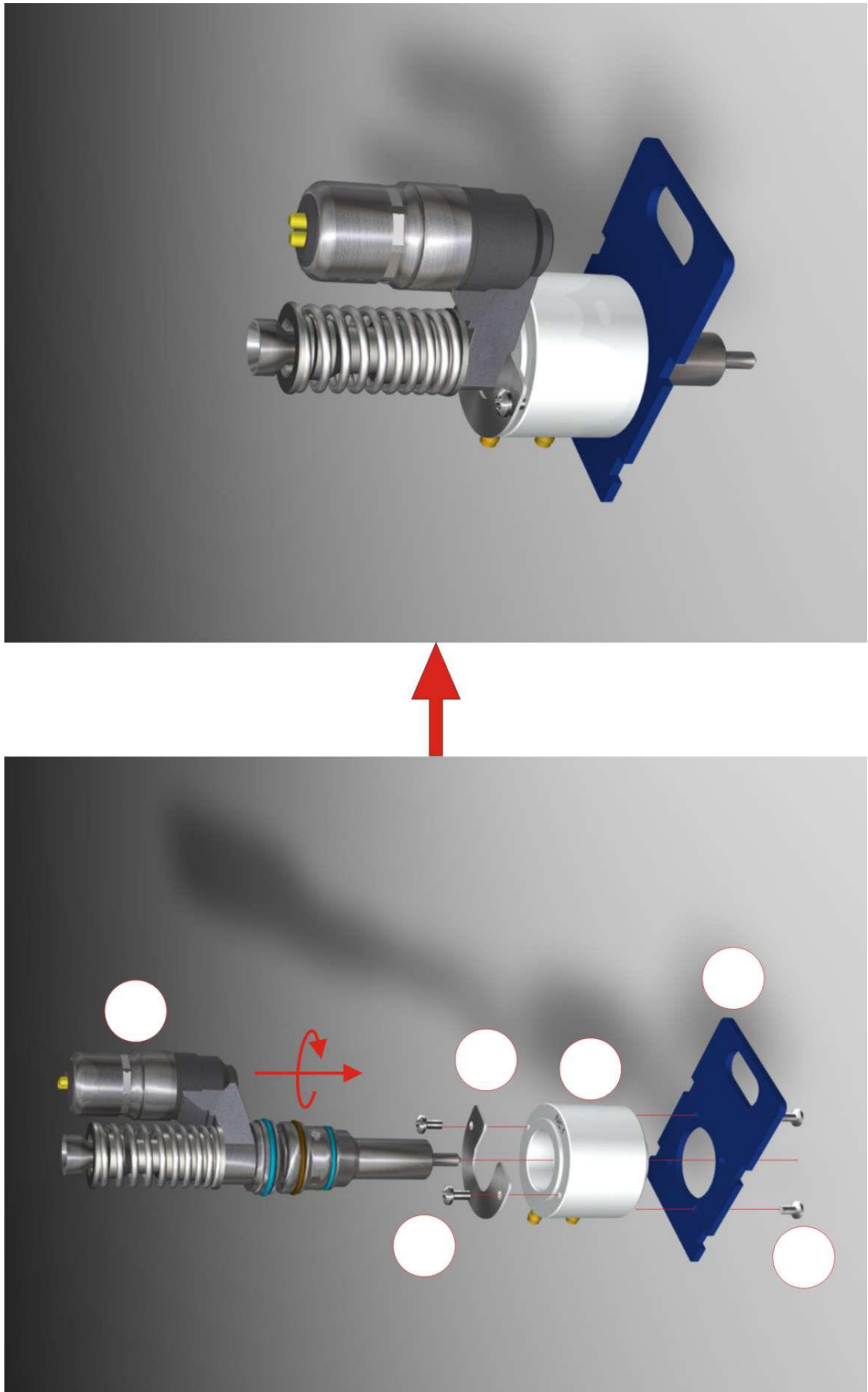


Figure 5-ii



## Injector Mounting to UA2 unit

Once the injector – adapter assembly is ready, it is ready to be mounted on the UA2 unit.

### **[info]**

- If needed, the Hydraulic lines can be connected to the adapter, before it is mounted on the UA2 unit

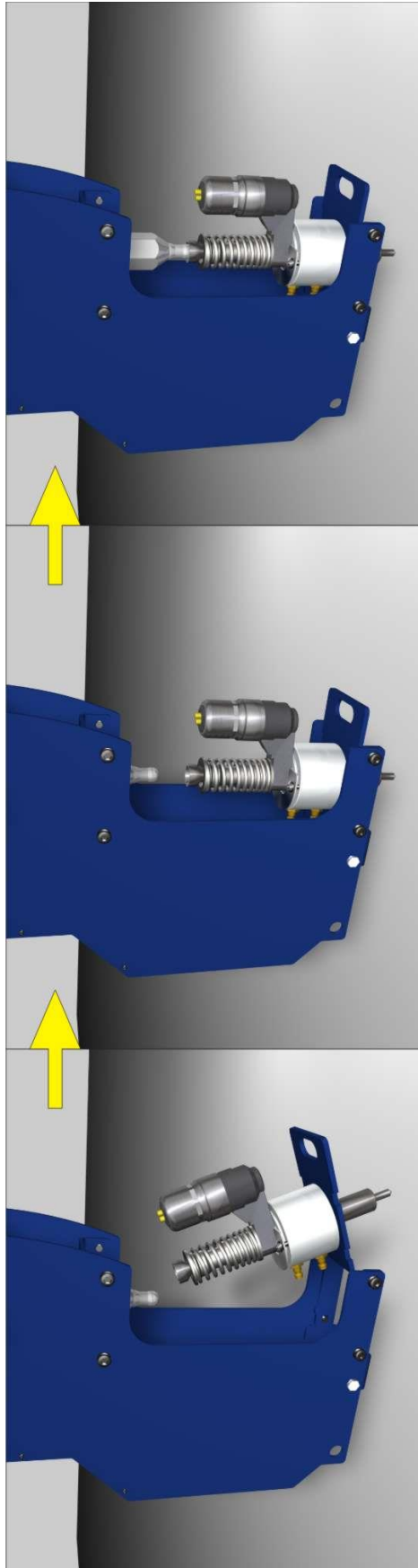


Figure 5-iii

## **Push Rod and Shims Adjustment**

Each injector type uses its own Push Rod. Once the injector is mounted on the UA2 unit, the Push Rod and the displacement Shims needed to be adjusted for proper operation.

### **Injector Spring Push Rod instructions:**

1. Bolt in the proper Push Rod
2. Lift up the Push Rod, using force
3. While lifting the Push Rod, unbolt the Push Rod (Counter-Clockwise) in order for it to sit firmly on the Injector Spring
4. Align the Push Rod in such a way in order to bolt the Allen securing screw.

### **Injector Spring Displacement Shims instructions:**

1. The UA2 unit is supplied with Shims of different heights (5, 4, 3 and 2 mm)
2. The Total Rod displacement is 24mm
3. Use as many Shims in order to subtract from the total. That will be the final spring stroke of the injector
4. When ready, use the accompanied shim locking hand nuts in order to secure together.

Please consult manufactures manual for further information.

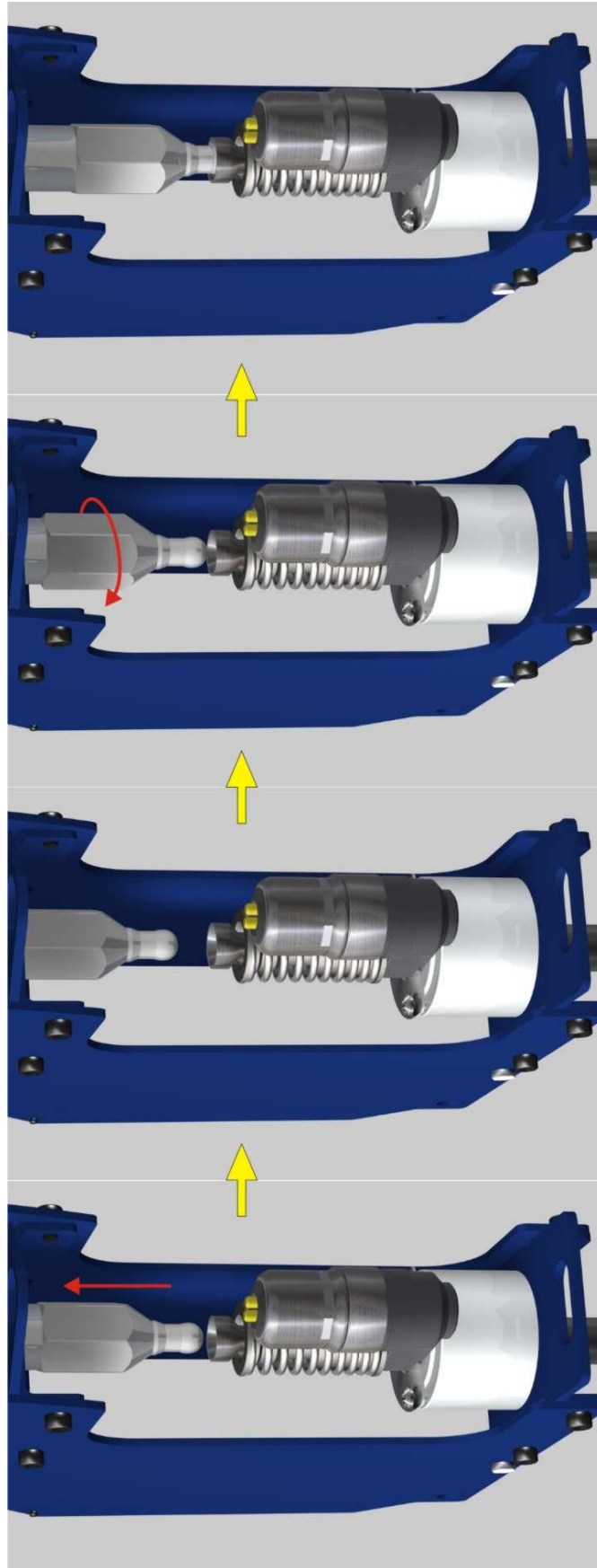
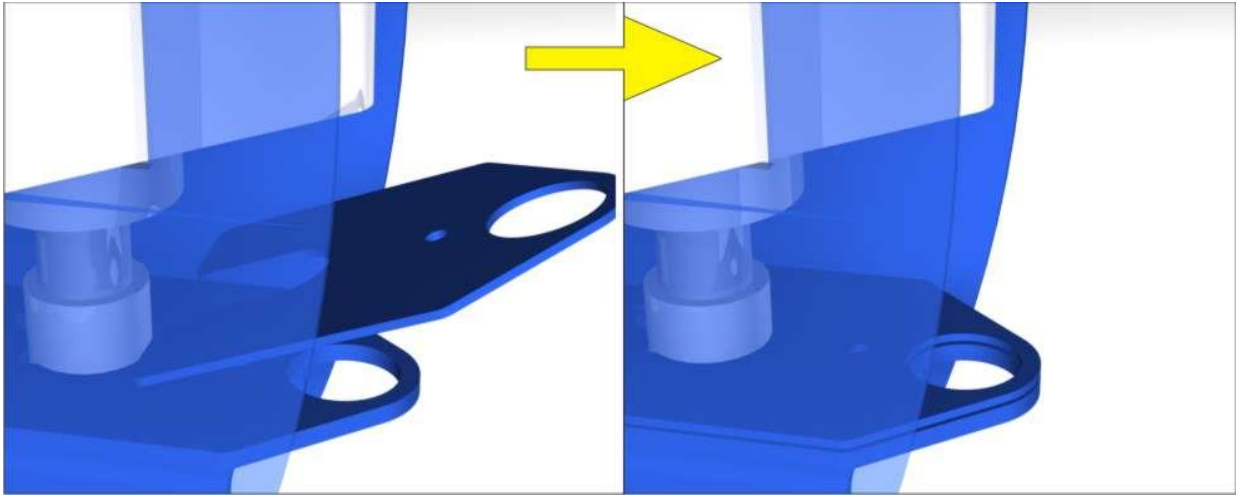
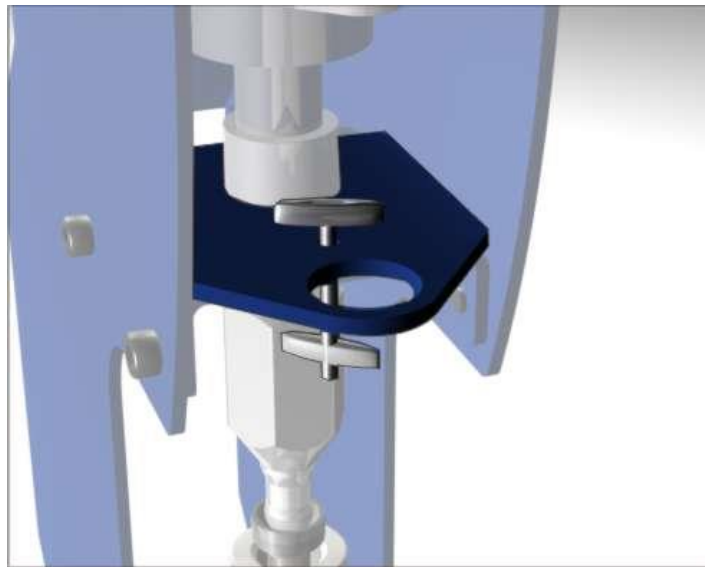


Figure 5-iv



**Figure 5-v**



**Figure 5-vi**

## Electrical Power to Injector

Use the Injector Harness [ih] from the main unit and any adapters needed, in order to connect to the injectors electrical actuator. If polarity is marked on an injector, the [ih] is clearly marked with a red dot, denoting the Positive side (+).

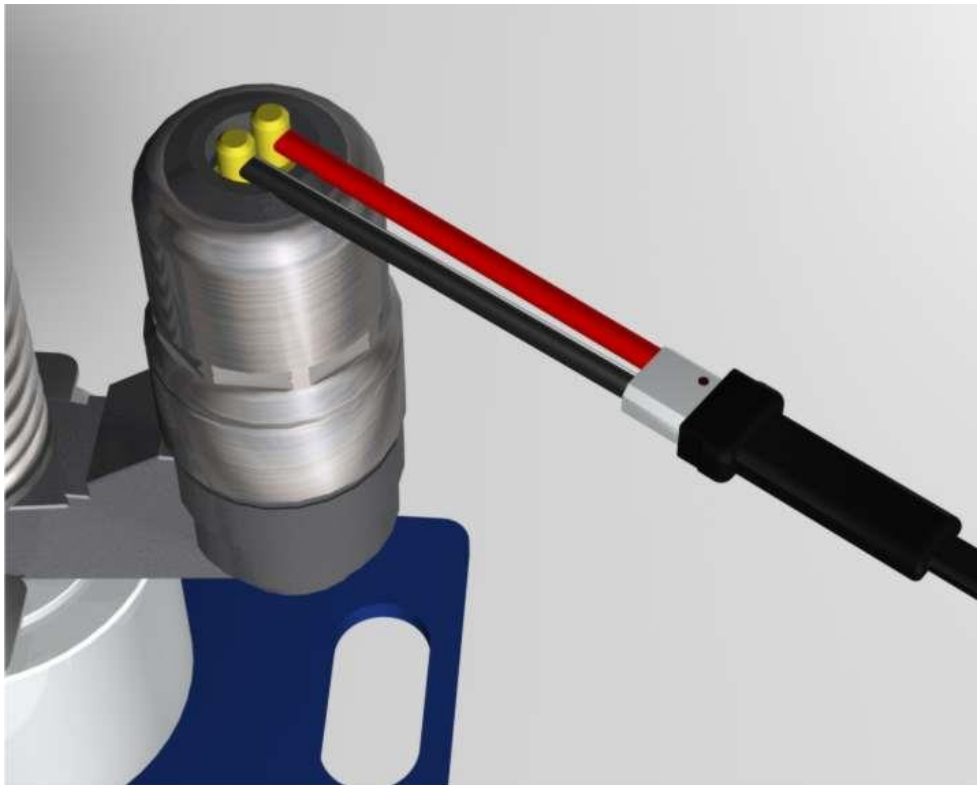


Figure 5-vii

# Chapter 6

## “Operation Basics”

In this chapter instructions with figures will be shown on how to perform a basic operation with the UA2 attachment unit. The following topics are covered:

- Cleaning Injectors with ultrasonic device
- Injector Hydraulic Connections
- Injector Spray Chamber Position and Connections
- Injector Volumetric Position and Connections
- Injector MACC Position and Connections
- Unit Injector Return Adjustment UIS[P]
- Sample Procedure on Testing injectors
- Sample Procedure on MACC cleaning injectors
- Injector Properties and Settings

A new user should fully understand this chapter prior to operating the UA2 attachment unit.

## Injector Ultrasonic Cleaner

Before mounting any injector on the UA2 attachment, it is obligatory to clean the Injectors (Nozzles) (Figure 6-i) in the ultrasonic device.

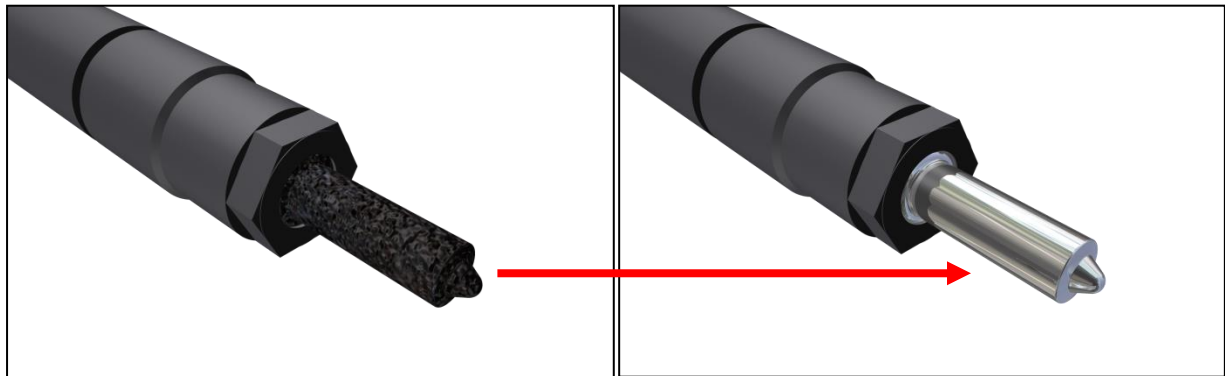


Figure 6-i

### Injector Ultrasonic Cleaning is Mandatory

Failure to clean injectors with the use of MAGNETI MARELLI's ultrasonic device (provided) before any test is completed on the test bench will void the warranty of all units involved. If valves internally are found with injector dirt particles (verified), the machine's warranty will be voided.

This step is needed, first to clean the (micro meter) nozzle openings as part of servicing the injector, and second to avoid any dirt particles to enter the main units hydraulic system.

The Ultrasonic Cleaning operation should be performed for **at least 15 minutes**, although 30 minutes is recommended.



## Injector Hydraulic Connections

Before proceeding with the operation of the injector, ensure all hydraulic connections (Rear and Front) are in order. In addition, please push in or pull out the Spray Tube assembly and tighten with the lock screw as shown in the figures below, when performing Spray, Volume or MACC.

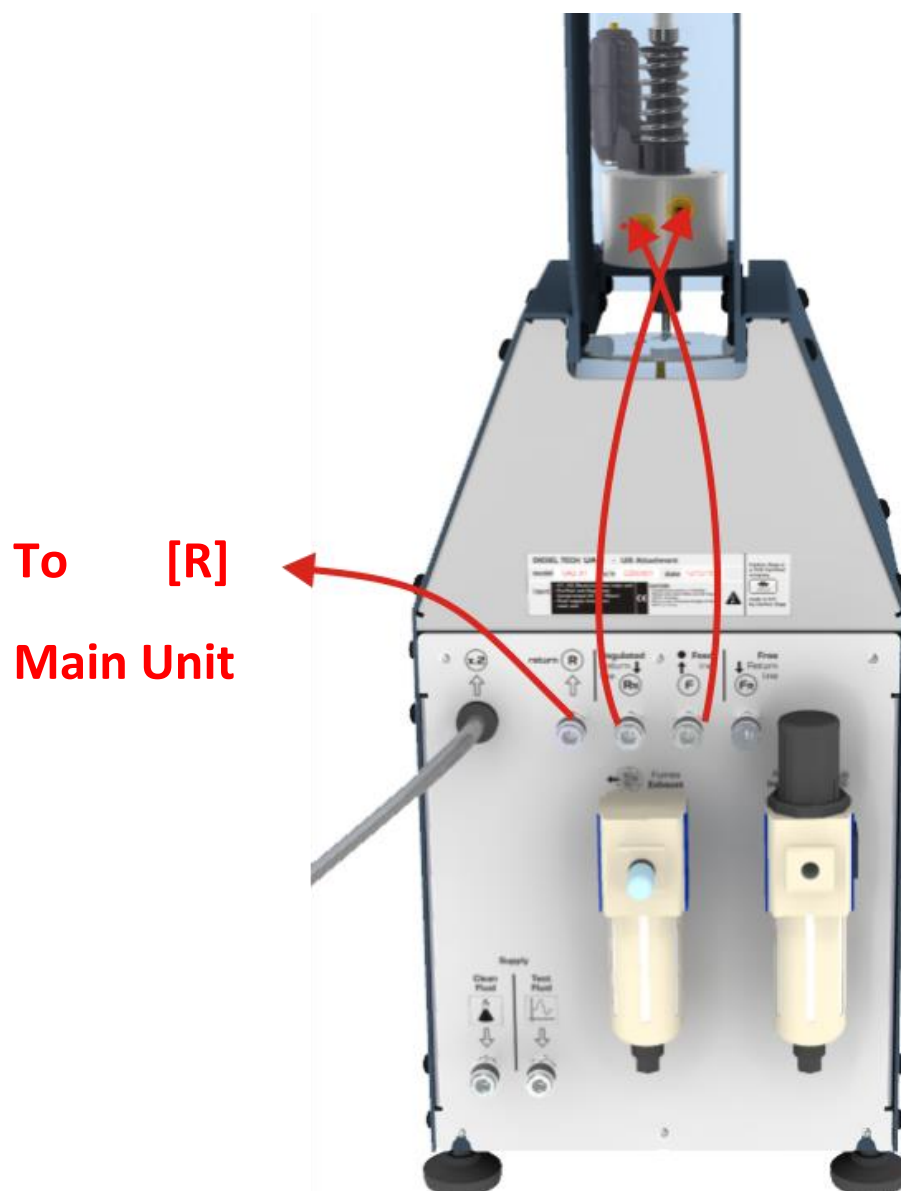


Figure 6-ii

**[important]**

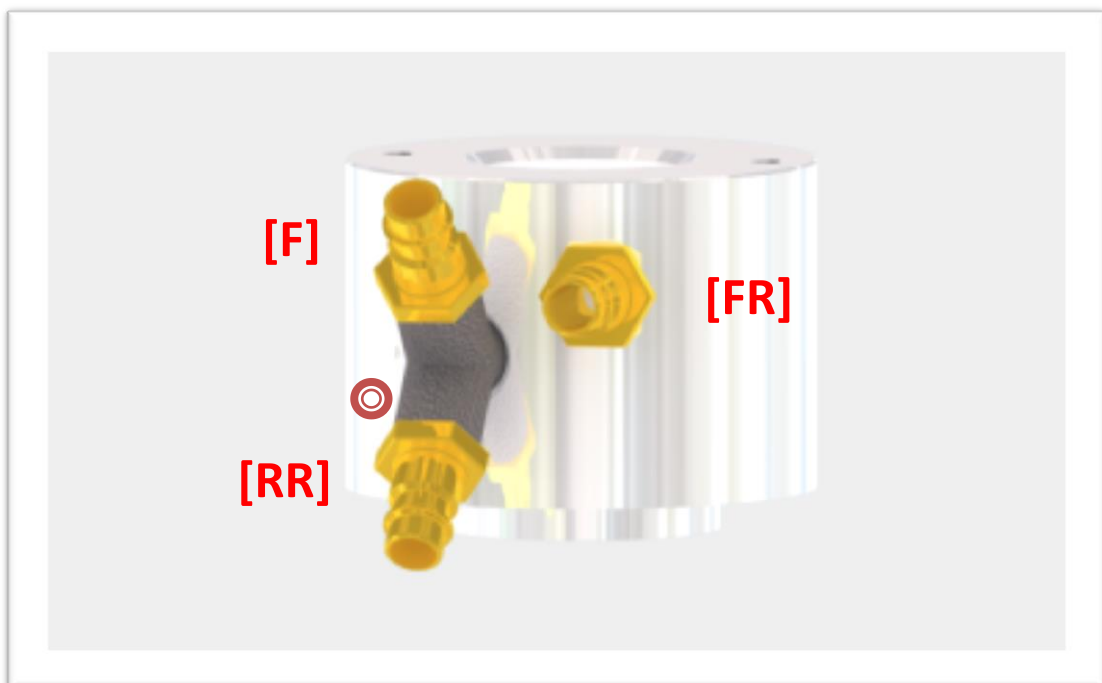
- The [R] connection from the UA2 unit connects to the [R] connection on the main unit.
- The [RR] connection from the UA2 unit connects to the Injector Adapter Return (When there is need to Regulate the Return – Most Standard Injector Types).
- The [F] connection from the UA2 unit connects to the Injector Adapter Feed Line. If the 2 connections on the adapter are on the same height, than there is no problem on where to connect the Feed Line, otherwise the Feed line is clearly denoted with an engraved dot.
- Some Injector Adapters (e.g. Cummins Injector adapters), have 3 ports to connect to. The [FR] connection from the UA2 unit connects to the Injector Adapter port and provides a free return , whereas the [F] and [RR] connect to a Y-Connector at the feed port of the adapter.

**Standard Adapter Connection:**



**Figure 6-iii**

**Cummins Adapter Connection:**



**Figure 6-iv**

## Injector Spray Chamber Position and Connections

In order to perform a Spray test on the UA2 unit, the Spray chamber assembly must be pulled out and secured, before inserting the injector. The [D] connection on the front [optional] is used to deliver the sprayed quantity back to the main unit (using the [D] connection on the main unit as well). Some versions do not require this connection.

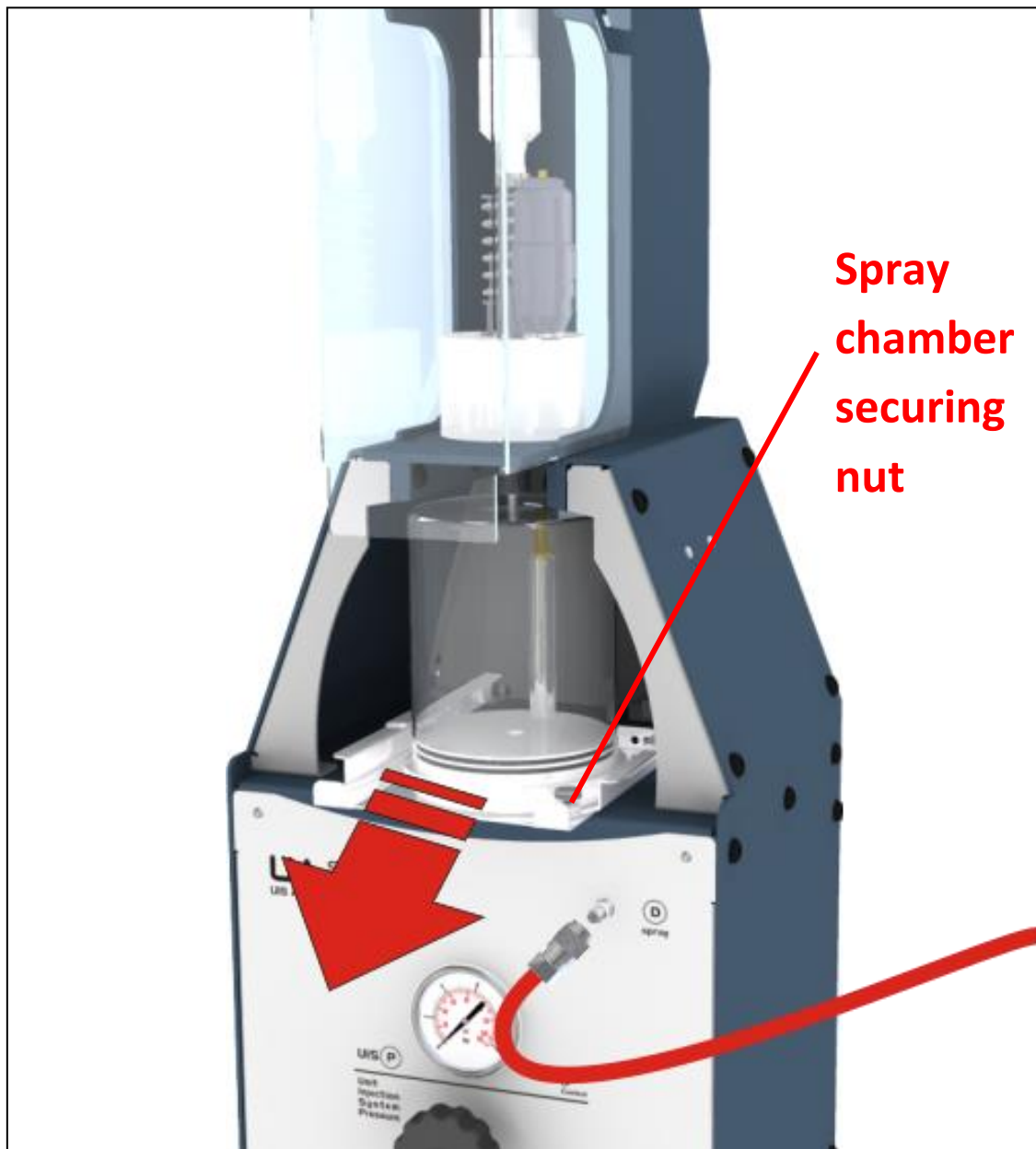


Figure 6-v

## Injector Volumetric Position and Connections

In order to perform a Volumetric test on the UA2 unit, the Spray chamber assembly must be Pushed in and secured, before inserting the injector; also the D-Adapt (provided with the main unit) needs to be connected to the injector nozzle and then to the [D] connection to the main unit.

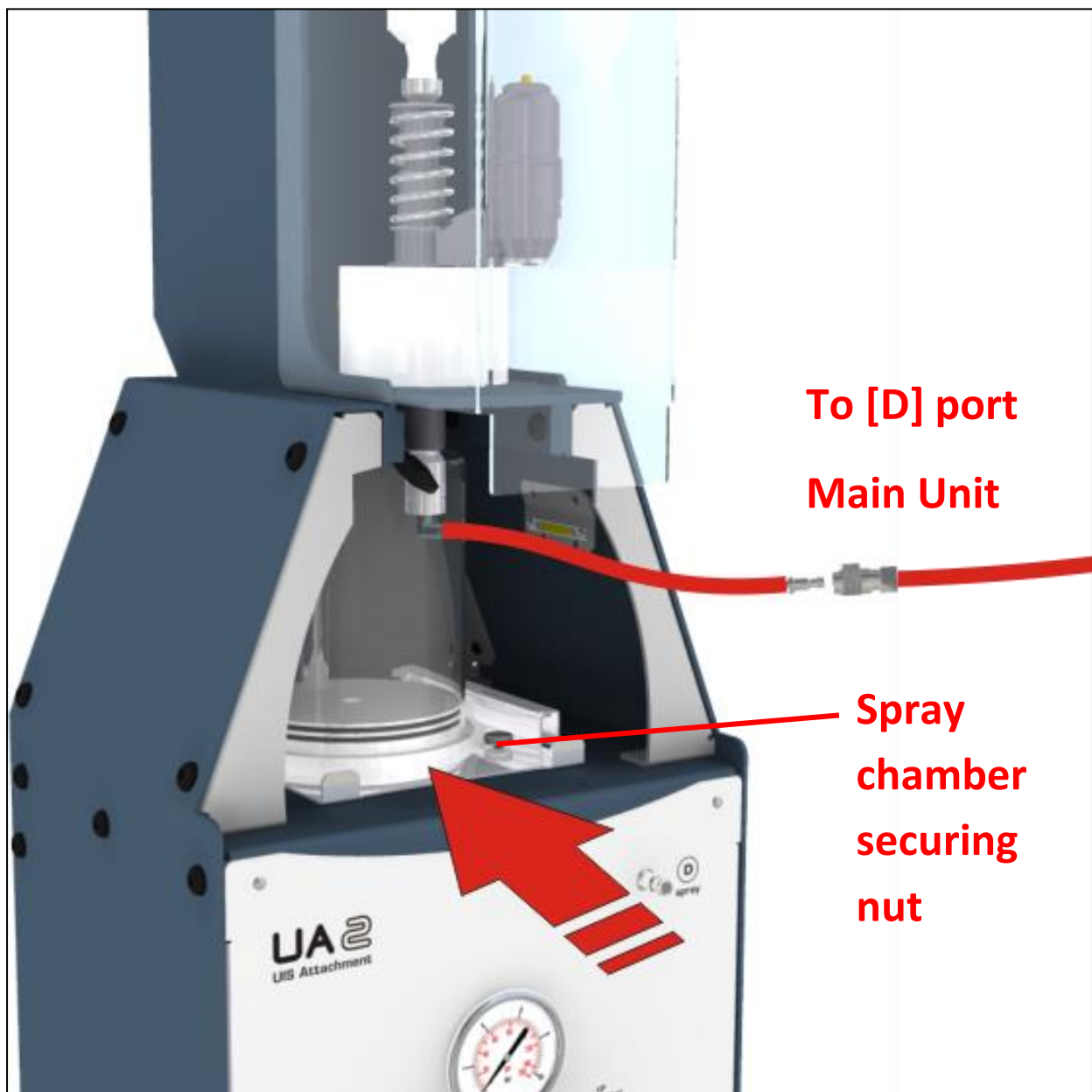


Figure 6-vi

## Injector MACC Position and Connections

In order to perform a MACC cleaning on the UA2 unit, the Spray chamber assembly must be Pushed in and locked, before inserting the injector; also the C-Adapt (provided with the main unit) needs to be connected to the injector nozzle and then to the [C] connection to the main unit along with the Return of the injector [R].

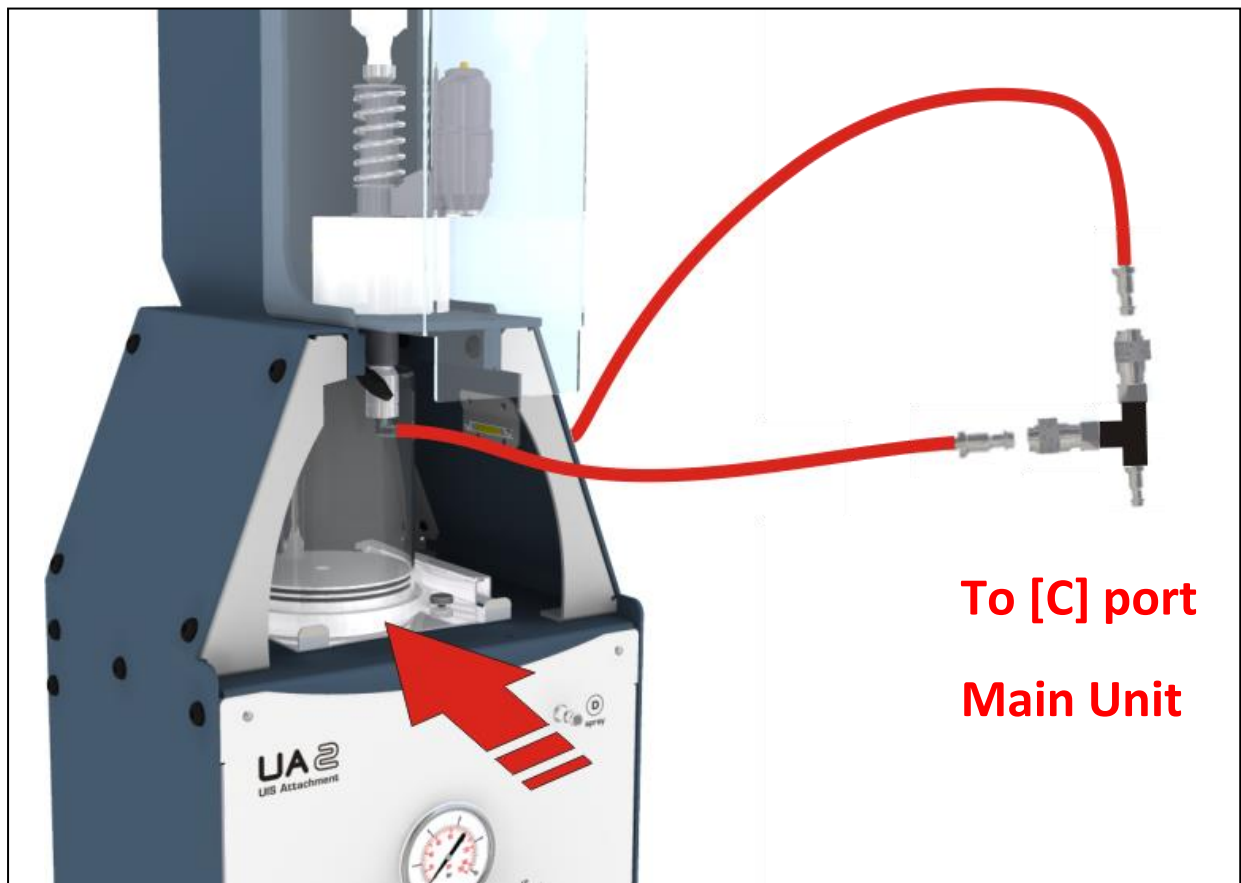


Figure 6-vii

## Unit Injector Return Adjustment UIS[P]

Every injector needs a low pressure (0-10bar) on the adapter, either on the Return port, or on the Feed port (e.g. Cummins). The UIS[P] Regulator is there to provide the option to select the appropriate pressure for the injector.

### [important]

- Always adjust pressure according to the manufacturer specifications.



Figure 6-viii

## Sample Procedure on Testing Injectors

When performing a test on a UIS system, always ensure the following:

- All Hydraulic connections are properly and securely connected
- All Pneumatic connections are properly and securely connected
- All Electrical connections are properly and securely connected
- The Injector has properly fitted in the adapter and on the unit
- The correct adapters for [D] and [R] have been selected
- The proper injector is selected from the main unit control panel.

The procedure for spray or volume testing is similar to that of the main units. Always ensure that the proper spray tube assembly position is selected, and adjust the T and W values from the main unit as needed.

### [important]

- If a **SENSOR TIMING ERROR** message appears on the bottom of the screen, the injector will not operate, please consult Chapter 7 “Troubleshooting”



## Sample Procedure on MACC cleaning Injectors

When performing a MACC cleaning on a UIS system, always ensure the following:

- All Hydraulic connections are properly and securely connected
- All Pneumatic connections are properly and securely connected
- All Electrical connections are properly and securely connected
- The Injector has properly fitted in the adapter and on the unit
- The correct [C] adapters have been selected
- The proper injector is selected from the main unit control panel.

The procedure for MACC cleaning is similar to that of the main units. Always ensure that the spray tube assembly position is pushed in, the C-Adapts are used and adjust the T and W values from the main unit as needed.

### [important]

- If a **SENSOR TIMING ERROR** message appears on the bottom of the screen, the injector will not operate, please consult Chapter 7 “Troubleshooting”

## Injector Properties and Settings

Below you can find general information on the settings for each injector brand and how that can be used on the UA2:

### **VOLVO / SCANIA / IVECO:**

Duration Range 3-20 ms

T < > -2.5 > +2.5 (default -1.6)

W ^ 35

Fuel Pressure UIS[P] 4.5Bar / 65 psi

Cam Stroke 14 mm – Stack Shims 5mm, 3mm, 2mm

### **VW PDE:**

Duration Range 2-15ms

T < > -2.0 > +2.0 (default -1.7)

W ^ 32

Fuel Pressure UIS[P] 6-8Bar / 90-115psi

Cam Stroke 10-12mm – Stack Shims 5mm, 5mm, 4mm

### **ACTROS / ATEGO:**

Duration Range 10-30ms

T < > -4.0 > +2.0 (default -1.5)

W ^ 35

Fuel Pressure UIS[P] 4.5Bar / 65 psi

Cam Stroke 16 mm – Stack Shims 5mm, 3mm

### **Detroit Diesel:**

Duration Range 5-20 ms

T < > -1.6

W ^ 35

Fuel Pressure UIS[P] 4.5Bar / 65 psi

Cam Stroke 15 mm – Stack Shims 5mm, 4mm

Pre-Load 10 Flats

**CAT (3406E):**

Duration Range 5-25 ms

T < > -1.5

W ^ 35

Fuel Pressure UIS[P] 4-5.5 Bar / 60-80 psi

Cam Stroke 16-18 mm – Stack Shims 4mm & 2mm  
(or 4mm & 4mm)

Pre-Load 12 Flats

**CAT (3176 A&B&C):**

Duration Range 15-35 ms

T < > -1.5

W ^ 35

Fuel Pressure UIS[P] 6 Bar / 90 psi

Cam Stroke 15-18mm – Stack Shims 4mm & 5mm  
(or 4mm & 3mm)

Pre-Load 2 Flats

**Cummins Celect:**

Duration 10-30ms

T < > 80-160 (default 120)

W ^ 35

Fuel Pressure 7Bar / 100 psi

Cam Stroke 16mm – Stack Shims 5mm & 3mm

Pre-Load 3 Flats

# Chapter 7

## “Troubleshooting”

MAGNETI MARELLI designed the UA2 attachment unit for durability. However, should problems occur, following the procedures in this chapter can help to determine the cause.

All UA2 attachment operators should become familiar with this chapter. Knowing what might go wrong can help prevent problems from occurring.

Symptom / Problem	Detailed Description	Solution / Repair
<b>INJECTOR NOT OPERATING</b>	<b>SENSOR TIMING ERROR</b> Flashes in the main unit control panel	<b>Possible Cause:</b> <ul style="list-style-type: none"> <li>• No or insufficient Air Supply</li> <li>• X.1 and X.2 connections are not connected</li> <li>• Wrong Injector manufacturer selected</li> <li>• T &amp; W not correctly calibrated</li> <li>• Push Rod not correctly positioned</li> <li>• Sensor on Cylinder is not in place</li> </ul> <b>Solutions:</b> <ul style="list-style-type: none"> <li>• Check all Pneumatic, Hydraulic and Electrical connection</li> <li>• Ensure proper air supply pressure and flow</li> <li>• Fine tune the T &amp; W values, or LOAD DEFAULTS from the main units SETTINGS menu</li> <li>• Using an Allen key, remove the top rear cover and fine tune the sensor position while the messages is flashing, until it stops.</li> </ul>
	<b>Faulty Injector</b>	The injector is not operable
	<b>No Fluid entering the Injector</b>	<ul style="list-style-type: none"> <li>• Check for adequate fluid in the Tanks</li> <li>• Ensure the Fluid Drain valve are switched on and the lines are connected between the main unit and the UA2 unit</li> <li>• Ensure x.1 and x.2 connections are properly connected</li> <li>• Adjust the UIS[P] to the proper manufacturer specification</li> </ul>

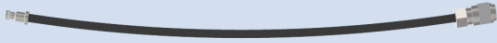



# Appendix A

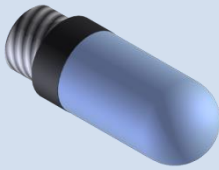
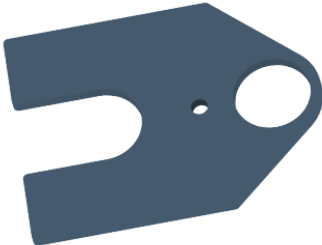
## “Specifications”

Description	Units	Value
Electrical Input	-	x.1 / x.2
Outer dimensions W / D / H	mm	117 / 44 / 33
Weight of UA2	Kg / Lbs	38 / 84
Weight of UA2 [Complete in Box]	Kg / Lbs	45 / 99
Input Air System Pressure	Bar / Psi	07-10 / 100-145
Recommended Min. Operating Pressure	Bar / Psi	08 / 115
Min. Inner Diameter of Input Supply Hose	mm	10
Min. Exhaust Hose if used to replace the Exhaust muffler	mm	14

# Appendix B

## “Adapters and Connectors”

CODE	DESCRIPTION	Qty	IMAGE
<b>D-HOSE</b>	D-Adapt Hose for Discharged Testing Calibration Oil for quick coupler [D]	1	
<b>R-HOSE</b>	R-Adapt Hose for Returned Testing Calibration Oil for quick coupler [R]	1	
<b>C-HOSE</b>	C-Adapt Hose for Cleaning MACC Process for quick couplers [C]	1	
<b>D-ADAPT T .10</b>	9mm D-Adapt for Discharged Testing Calibration Oil for quick coupler [D]	1	

<b>VMF</b>	Vacuum Muffler for connecting to the rear Spray Chamber fumes extractor (Figure 2-iii-[e])	<b>1</b>	
<b>SHIM</b>	Displacement Shims of different widths (5, 4, 3, 2 mm)	<b>4</b>	
<b>MISC</b>	Miscellaneous Hoses and Adapters for Injector Adapter Feed and Return lines as well as Metallic adapters and cables	-	No image available

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